

## EPA Official Record

**Mail ID:** c5b1897bf7f94f7183073d23ac5b7223

**From:** Jetter, James

**To:** iocko@edf.org

**Copy To:** rchiang@cleancookstoves.org; jtweddell@cleancookstoves.org; svaldez@unfoundation.org; Mitchell, John

**Delivered Date:** 09/06/2013 03:28 PM EDT

**Subject:** RE: Environmental Defense Fund Request for Help with Cookstove Testing

Dear Ilissa,

Sorry for the delay, but following are my responses to your questions:

1. Do you know of reliable testing sites in the U.S., Europe, or India?

A list of stove testing sites with contact info is below (at the bottom) – these sites vary greatly in their capabilities – most do not (yet) have the capability to measure BC. There are other organizations (not on the list) that have capability to measure black carbon, but sites that I know have capability for measuring black carbon emissions specifically from cookstoves are:

- University of Illinois
- Berkeley Air Monitoring Group
- Colorado State University
- Lawrence Berkeley National Laboratory
- U.S. EPA

2. What is the technology that reduces black carbon emissions? Is it something simple that captures the BC? If so, what is the cost for this specific technology?

Improved combustion technologies can reduce soot (black carbon) emissions. There may be other innovations, but some technologies that can potentially reduce black carbon emissions are:

- Forced-draft combustion (e.g., fan stoves)
- TLUD (top-lit up-draft) combustion (especially with processed solid fuels, such as pellets)
- Liquid (such as alcohol) and gas (such as LPG and biogas) fuels
- Solar cookers

These technologies must be carefully designed and implemented to reduce emissions – we've seen some examples of these technologies that do not reduce emissions. I think technologies that capture BC (e.g., filtration, electrostatic precipitation, scrubbers, etc.) are unlikely to be practical for cookstoves.

3. We have explored some options for measuring BC emissions that are somewhat accessible, such as a SIDEPAKTM AM510 Personal Aerosol Monitor or using a self-designed real-time sampling system - the ARACHNE (Ambulatory Real-time Analyzer for Climate and Health related Noxious Emissions) - where real-time scattering and absorption coefficients of emitted particles can be measured using a single wavelength nephelometer and a 3-wavelength Particle Soot Absorption Photometer, respectively. Are you familiar with these measurement techniques, and if so, what is your assessment of them?

Accurately measuring BC emissions is a complicated issue:

<http://www.atmos-chem-phys-discuss.net/13/9485/2013/acpd-13-9485-2013.html>

Recommendations for the interpretation of "black carbon" measurements. A. Petzold et al. Atmospheric Chemistry and Physics Discussions (in review)

The TSI Model AM510 SidePak Personal Aerosol Monitor measures particulate matter, but not BC specifically. I have not used this device, but it is based on a light-scattering sensor, similar to some other relatively low-cost devices. Light-scattering sensors are not sensitive to very small soot particles – the sensors do not “see” the smallest ultrafine particles.

The ARACHNE system was developed by the University of Illinois for measuring emissions in the field. I think it was (is) a good system, but I’m not sure if it is available to users outside of the research group that developed it.

I think the easiest method for indicating black carbon may be the transmissometer:

[http://www.mageesci.com/sootscan\\_model\\_ot21\\_transmissometer/sootscan\\_model\\_ot21\\_transmissometer.html](http://www.mageesci.com/sootscan_model_ot21_transmissometer/sootscan_model_ot21_transmissometer.html)

Many of the testing centers listed below are already using (or are planning to use) the gravimetric (filter) method for measuring PM (particulate matter) emissions. The same filters that are collected to measure PM may be used to indicate BC with the transmissometer.

We are using the thermal-optical method to analyze particulate matter for OC (organic carbon) and EC (elemental carbon) – an indicator of black carbon. This is a relatively high-cost method.

We are also using an aethalometer to measure BC:

<http://aethlabs.com/microaeth>

This is a relatively low-cost device designed to measure ambient (low) levels of BC, but we are using a relatively high-cost system to accurately dilute the emissions to a level that can be consistently measured with the aethalometer.

We are also using relatively high-cost instruments to characterize light absorption and light scattering of particles at multiple wavelengths in real-time:

<http://www.dropletmeasurement.com/products/airborne/PASS-3>

<http://www.ecotech.com/particulates/3-wavelength-nephelometer>

Hope this is helpful.

What types of cookstoves has EDF distributed to homes in India?

Regards,

Jim

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James J. Jetter, P.E.

U.S. Environmental Protection Agency (E305-03)

National Risk Management Research Laboratory

Air Pollution Prevention and Control Division

Research Triangle Park, NC 27711, USA

phone: (919) 541-4830 fax: (919) 541-2157

email: [jetter.jim@epa.gov](mailto:jetter.jim@epa.gov)

**From:** Ilissa Ocko [<mailto:iocko@edf.org>]

**Sent:** Monday, August 26, 2013 10:47 AM

**To:** Jetter, James

**Subject:** Environmental Defense Fund Request for Help with Cookstove Testing

Dear Mr. Jetter,

I am a scientist at the Environmental Defense Fund. I recently received your contact information from Dr. Jennifer Burney as someone who has done a lot of testing on existing cookstove technologies and is a leader in the standardization of testing.

I am reaching out because I have a few questions about cookstoves that I am hopeful you will be able to help us with. EDF has currently distributed 80,000 cookstoves to homes in India, but the cookstoves have only been tested for thermal efficiency. Before they continue to deploy cookstoves, they would like to have the cookstove tested for soot efficiency to see how much their specific cookstove technology reduces black carbon emissions.

My questions are as follows:

4. Do you know of reliable testing sites in the U.S., Europe, or India?
5. What is the technology that reduces black carbon emissions? Is it something simple that captures the BC? If so, what is the cost for this specific technology?
6. We have explored some options for measuring BC emissions that are somewhat accessible, such as a SIDEPAKTM AM510 Personal Aerosol Monitor or using a self-designed real-time sampling system - the ARACHNE (Ambulatory Real-time Analyzer for Climate and Health related Noxious Emissions) - where real-time scattering and absorption coefficients of emitted particles can be measured using a single wavelength nephelometer and a 3-wavelength Particle Soot Absorption Photometer, respectively. Are you familiar with these measurement techniques, and if so, what is your assessment of them?

If you prefer discussing over the phone, I am more than happy to do so. We sincerely appreciate your time and any help that you can offer.

Best,  
Ilissa Ocko

**Ilissa Ocko, Ph.D.**  
High-Meadows Post-Doctoral Science Fellow

**Environmental Defense Fund**

257 Park Avenue  
New York, NY 10010  
T 212 616 1228  
[iocko@edf.org](mailto:iocko@edf.org)

Organization	Location	Point of Contact	E-mail Address
<a href="#">Stove Testing Center</a>	La Paz, Bolivia	Marcelo Gorritty	<a href="mailto:mgorritty@gmail.com">mgorritty@gmail.com</a>
<a href="#">GERES Biomass Energy Lab</a>	Phnom Penh, Cambodia	David Beritault	<a href="mailto:d.beritault@geres.eu">d.beritault@geres.eu</a>
<a href="#">Beijing University of Chemical Technology (BUCT)</a>	Beijing, China	Guangqing Liu	<a href="mailto:guangqing.liu@gmail.com">guangqing.liu@gmail.com</a>
<a href="#">China Agricultural University (CAU)</a>	Beijing, China	Yuguang Zhou	<a href="mailto:zhouyg@cau.edu.cn">zhouyg@cau.edu.cn</a>
GIZ Ethiopia	Ethiopia	Alemayehu Zeleke	<a href="mailto:alemayehu.zeleke@giz.de">alemayehu.zeleke@giz.de</a>

<a href="#"><u>Council for Scientific and Industrial Research (CSIR)</u></a>	Accra, Ghana	Gabriel Nii Laryea	<a href="mailto:gabniilar@yahoo.com"><u>gabniilar@yahoo.com</u></a>
<a href="#"><u>Improved Cooking Technology Program</u></a>	Port au Prince, Haiti	Jean Robert Altidor	<a href="mailto:csaaltidor@gmail.com"><u>csaaltidor@gmail.com</u></a>
<a href="#"><u>Zamorano University Improved Stove Certification Center</u></a>	Tegucigalpa, Honduras	Timothy Longwell	<a href="mailto:tlongwell@zamorano.edu"><u>tlongwell@zamorano.edu</u></a>
<a href="#"><u>Indian Institute of Technology-Delhi (IIT-Delhi)</u></a>	New Delhi, India	Rajendra Prasad	<a href="mailto:rprasadiitd@gmail.com"><u>rprasadiitd@gmail.com</u></a>
<a href="#"><u>Prakti Design Lab</u></a>	Pondicherry, India	Mouhsine Serrar	<a href="mailto:mouhsine@praktidesign.com"><u>mouhsine@praktidesign.com</u></a>
The Energy and Resources Institute (TERI)	New Delhi, India	Perumal Raman	<a href="mailto:praman@teri.res.in"><u>praman@teri.res.in</u></a>
Asia Regional Cookstove Program (ARECOP)	Yogyakarta, Indonesia	Christina Aristanti Tjondroputro	<a href="mailto:christina@arecop.org"><u>christina@arecop.org</u></a>
<a href="#"><u>Kenya Industrial Research and Development Institute (KIRDI) Stove Testing Centre</u></a>	Nairobi, Kenya	Nathan Bogonko	<a href="mailto:nbogonko@gmail.com"><u>nbogonko@gmail.com</u></a>
<a href="#"><u>Universidad Nacional Autónoma de México (UNAM)</u></a>	Mexico City, Mexico	Victor Berrueta	<a href="mailto:vberrueta@gmail.com"><u>vberrueta@gmail.com</u></a>
GIZ /EnDev Mozambique	Mozambique	Rosario Loayza Cortez	<a href="mailto:rosario.loayza@giz.de"><u>rosario.loayza@giz.de</u></a>
<a href="#"><u>Centre for Rural Technology, Nepal (CRT/N)</u></a>	Kathmandu, Nepal	Hari Gopal Gorkhali	<a href="mailto:gorkhali@crtnepal.org"><u>gorkhali@crtnepal.org</u></a>
<a href="#"><u>Regional Stoves Development and Testing Center at the International Centre for Energy, Environment and Development (ICEED)</u></a>	Afikpo, Nigeria	Joseph Dioha	<a href="mailto:diohaij@yahoo.com"><u>diohaij@yahoo.com</u></a>
Laboratorio de Certificación de Cocinas Mejoradas (SENCICO)	Lima, Peru	Gabriela Esparza Requejo	<a href="mailto:gesparza@sencico.gob.pe"><u>gesparza@sencico.gob.pe</u></a>
<a href="#"><u>The Centre for Study and Research on Renewable Energy (CERER)</u></a>	Dakar, Senegal	Issakha Youm	<a href="mailto:iyoum2@yahoo.fr"><u>iyoum2@yahoo.fr</u></a>
<a href="#"><u>Sustainable energy Technology and Research Centre (SeTAR)</u></a>	Johannesburg, South Africa	Harold Annegarn	<a href="mailto:hannegarn@gmail.com"><u>hannegarn@gmail.com</u></a>
Nelson Mandel African Institute of Science and Technology	Arusha, Tanzania	K.N. Njau	<a href="mailto:karoli.njau@nm-aist.ac.tz"><u>karoli.njau@nm-aist.ac.tz</u></a>
<a href="#"><u>Asian Institute of Technology</u></a>	Khlong Nueng, Thailand	Nguyen Thi Kim Oanh	<a href="mailto:kimoanh@ait.ac.th"><u>kimoanh@ait.ac.th</u></a>

<a href="#"><u>Dili Institute of Technology (DIT)</u></a>	Dili, Timor Leste	Lidio Inacio Freitas	<a href="mailto:if_lidio@yahoo.com"><u>if_lidio@yahoo.com</u></a>
<a href="#"><u>Centre for Integrated Research and Community Development Uganda (CIRCODU)</u></a>	Kampala, Uganda	Joseph Arineitwe Ndemere	<a href="mailto:josephndemere@gmail.com"><u>josephndemere@gmail.com</u></a>
<a href="#"><u>Centre for Research in Energy and Energy Conservation (CREEC)</u></a>	Kampala, Uganda	Karsten Bechtel	<a href="mailto:karsten@tech.mak.ac.ug"><u>karsten@tech.mak.ac.ug</u></a>
<a href="#"><u>Aprovecho Research Center</u></a>	Cottage Grove, U.S.A.	Dean Still	<a href="mailto:deankstill@gmail.com"><u>deankstill@gmail.com</u></a>
<a href="#"><u>Berkeley Air Monitoring Group</u></a>	Berkeley, U.S.A.	Michael Johnson	<a href="mailto:mjohnson@berkeleyair.com"><u>mjohnson@berkeleyair.com</u></a>
<a href="#"><u>Burn Design Lab</u></a>	Vashon Island, U.S.A.	Paul Means	<a href="mailto:paul@burndesignlab.org"><u>paul@burndesignlab.org</u></a>
<a href="#"><u>Clarkson University</u></a>	Potsdam, U.S.A.	Phillip Hopke	<a href="mailto:phopke@clarkson.edu"><u>phopke@clarkson.edu</u></a>
<a href="#"><u>Colorado State University</u></a>	Fort Collins, U.S.A.	Morgan DeFoort	<a href="mailto:Morgan.DeFoort@Colostate.edu"><u>Morgan.DeFoort@Colostate.edu</u></a>
<a href="#"><u>Iowa State University</u></a>	Ames, U.S.A.	Mark Bryden	<a href="mailto:kmbryden@iastate.edu"><u>kmbryden@iastate.edu</u></a>
<a href="#"><u>Lawrence Berkeley National Laboratory</u></a>	Berkeley, U.S.A.	Ashok Gadgil	<a href="mailto:gadgil@ce.berkeley.edu"><u>gadgil@ce.berkeley.edu</u></a>
<a href="#"><u>U.S. Environmental Protection Agency</u></a>	Research Triangle Park, U.S.A.	Jim Jetter	<a href="mailto:jetter.jim@epa.gov"><u>jetter.jim@epa.gov</u></a>
<a href="#"><u>University of Illinois, Urbana Champaign</u></a>	Urbana Champaign, U.S.A.	Tami Bond	<a href="mailto:yark@illinois.edu"><u>yark@illinois.edu</u></a>